NTSB National Transportation Safety Board

Collaboration – A Very Powerful Tool for Improvement: Aviation Success Transferable to Education?

Presentation to:

San Bernardino City Unified School District

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NTSB 101

– **Independent federal agency, investigate transportation mishaps, all modes**

– **Determine probable cause(s) and make recommendations to prevent recurrences**

– **Primary product: Safety recommendations**
  - **Favorable response > 80%**

– *SINGLE FOCUS IS SAFETY*

– **Independence**
  - **Political: Findings and recommendations based upon evidence rather than politics**
  - **Functional: No "dog in the fight"**

Ingredients of a Quality Process

- – **Reliability:** *Minimal likelihood of a process BREAKDOWN*

- – **Safety:** No *INJURY or DAMAGE*

- – **Productivity:** Greatest *OUTPUT for least INPUT*

Challenge

How to improve

RELIABILITY, SAFETY, and PRODUCTIVITY

at the

SAME TIME???

*Particularly when conventional wisdom is that
improvements that improve safety
usually reduce productivity, and vice-versa*

Solution: Collaboration

Everyone who is

involved in the *problem*

should also be

involved in developing the *solution*

Outline

- **The Challenge**

- **Collaboration Successes in Aviation**
  - **Industry Level**
  - **Manufacturer Level**

- **Challenges of Prioritization**

- **Collaboration to Improve Education?**

The Challenge in Aviation

- **More System** *Interdependencies*
  - Large, complex, interactive system
  - Often tightly coupled
  - Hi-tech components
  - Continuous innovation
  - Ongoing evolution

- **Safety Issues Are More Likely to Involve** *Interactions Between Parts of the System*

AIRLINES

PILOTS   CONTROLLERS

The System

MECHANICS   MANUFACTURERS

INVESTIGATOR

REGULATOR
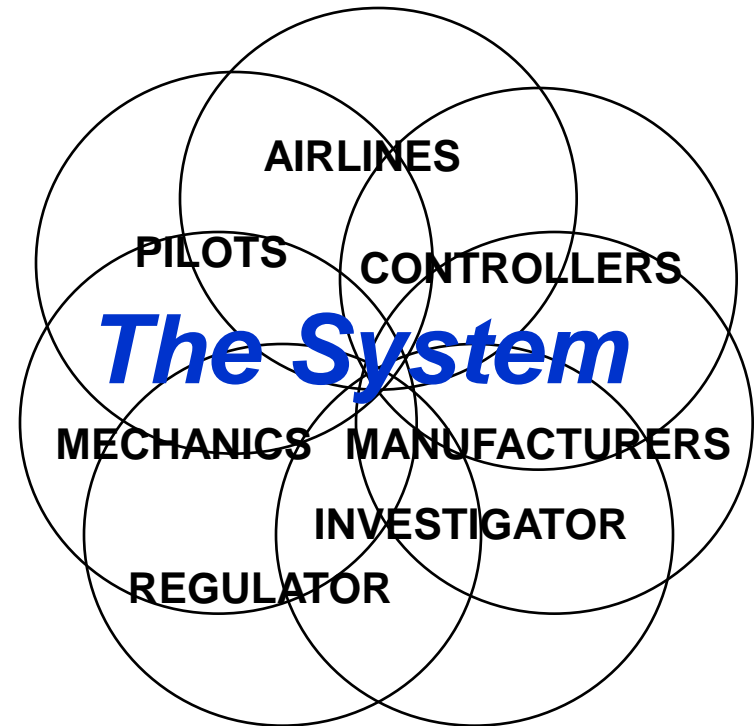
The Solution: System Think

Understanding how a change in one subsystem of a complex system may affect other subsystems within that system

"System Think" via Collaboration

Bringing all parts of a complex system together to collaboratively

- **Identify potential issues**

- *PRIORITIZE* **the issues**

- **Develop solutions for the prioritized issues**

- **Evaluate whether the solutions are**
  – **Accomplishing the desired result, and**
  – **Not creating unintended consequences**

Major Paradigm Shift

How It Is Now . . .

You are highly trained

and

If you did as trained, you would not make mistakes

so

You weren't careful enough

so

You should be PUNISHED!

How It Should Be . . .

You are human

and

Humans make mistakes

so

Let's *also* explore why the system allowed, or failed to accommodate, your mistake

and

Let's IMPROVE THE SYSTEM!

The Health Care Industry

To Err Is Human:

Building a Safer Health System

"The focus must shift from blaming individuals for past errors to a focus on preventing future errors by designing safety into the system."

Institute of Medicine, Committee on Quality of Health Care in America, 1999

Major Source of Information: Hands-On "Front-Line" Employees

"We Knew About That Problem"

(and we knew it might hurt

someone sooner or later)

From Data to Information

*Tools and processes to convert
large quantities of data into useful information*

Data Sources

Info from
front
line
staff
and
other
sources

DATA

Analysts

Tools

Processes

USEFUL

INFORMATION

Smart Decisions

- **Identify
  issues**

- *PRIORITIZE!!!*

- **Develop
  solutions**

- **Evaluate
  interventions**

Commercial Aviation Safety Team (CAST)

Engage _All_ Participants In Identifying Problems and Developing and Evaluating Remedies

- **Airlines**

- **Manufacturers**
  - *With the systemwide effort*
  - *With their own end users*

- **Air Traffic Organizations**

- **Labor**
  - *Pilots*
  - *Mechanics*
  - *Air traffic controllers*

- **Regulator(s) [Query: Investigator(s)?]**

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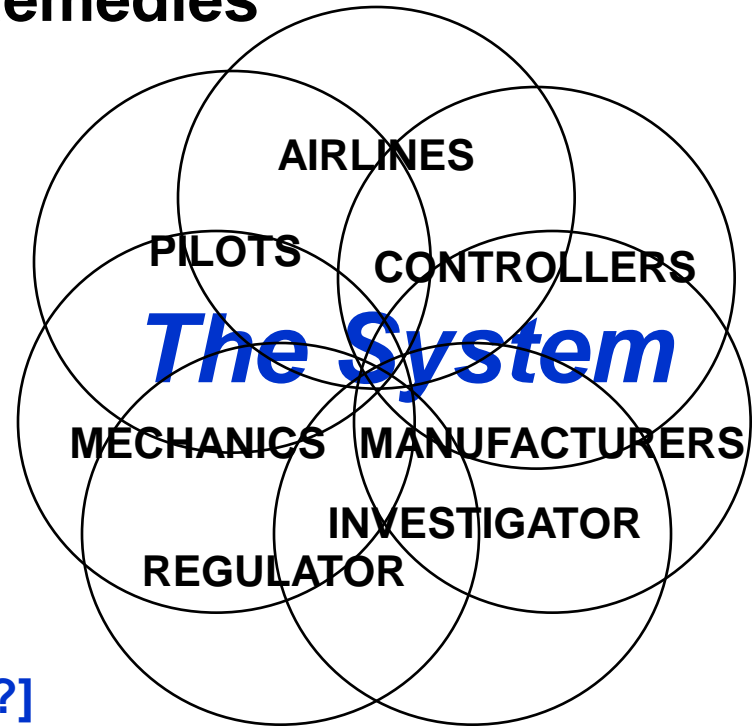
Aviation Success Story

65% Decrease **in Fatal Accident Rate, 1997 - 2007**

largely because of

System Think

fueled by

Proactive Safety Information Programs

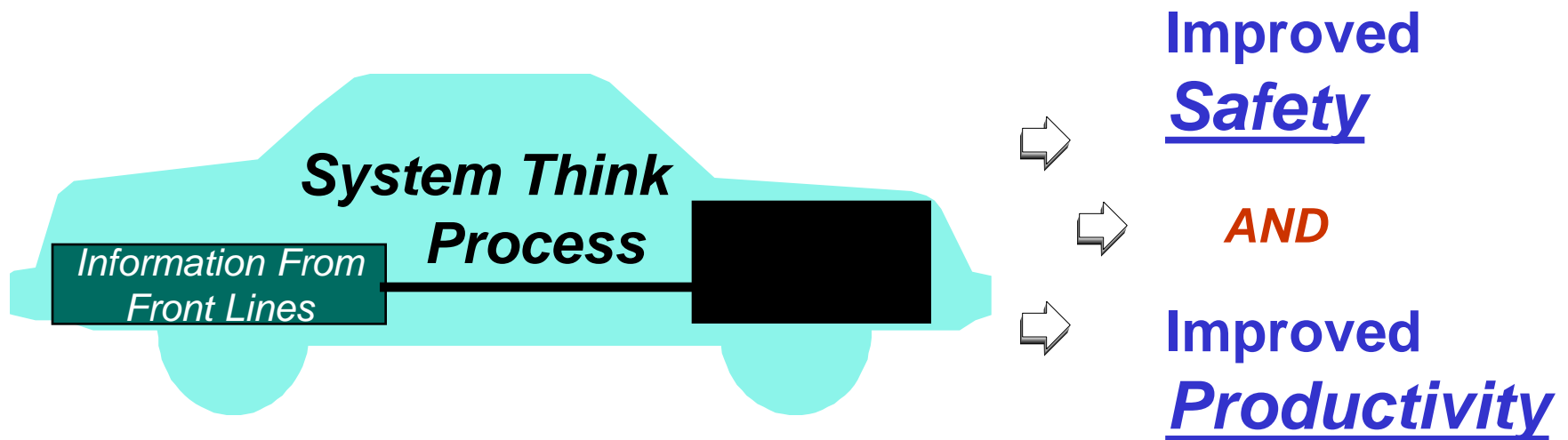**P.S. Aviation was already considered _VERY SAFE_ in 1997!!**

Another Major Paradigm Shift

– **Old: The regulator identifies a problem, develops solutions**

  - Industry skeptical of regulator's understanding of the problem
  - Industry fights regulator's solution and/or implements it begrudgingly

– **New: Collaborative "System Think"**

  - All participants involved in identifying problem
  - Industry "buy-in" re interventions because everyone had input, everyone's interests considered
  - Prompt and willing implementation
  - Interventions evaluated **. . .** *and tweaked as needed*
  - Solutions probably more effective and efficient
  - Unintended consequences much less likely

Challenges of Collaboration

- Human nature: "I'm doing great . . . *the problem is everyone else*"

- Participants may have competing interests, e.g.,
  - Labor/management issues
  - May be potential co-defendants

- Regulator probably not welcome

- Not a democracy
  - Regulator must regulate

- Requires all to be willing, *in their enlightened self-interest,* to leave their "comfort zone" and think of the System

Actually a Win-Win-Win

System Think Process

Information From Front Lines

Improved **_Safety_**

AND

Improved **_Productivity_**

P.S. Collaboration also significantly reduces the likelihood of unintended consequences!

Collaboration at Other Levels

- **Collaboration can be successful at any macro/micro level, including**

  – **Entire industry**

  – **Company (some or all)**

  – **Type of activity**

  – **Facility**

  – **Team**

- **Persistent process challenge?**

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Manufacturer Level "System Think"

Aircraft manufacturers are increasingly seeking input, from the earliest phases of the design process, from

- *Pilots*   (*User* Friendly)

- *Mechanics*   (*Maintenance* Friendly)

- *Air Traffic Services*   (*System* Friendly)

Next Challenge: Prioritization

You will probably identify *more potential concerns* than you have resources to address

$$
\begin{array}{l}
\ \text{Cost to address potential concern 1} \\
+\ \text{Cost to address potential concern 2} \\
+\ \text{Cost to address potential concern 3} \\
+\ \quad\ .\ \ .\ \ . \\
+\ \quad\ .\ \ .\ \ . \\
+\ \quad\ .\ \ .\ \ . \\
+\ \text{Cost to address potential concern "n"} \\
\hline
\ \textit{Total: More than available resources}
\end{array}
$$

So . . . how to decide, *BEFORE* a mishap (i.e., *WITHOUT the benefit of 20-20 hindsight),* what to fix first?

Factors to Consider

- – **Severity and likelihood – past, present, and future**

- – **Cost of remedy**

- – **Synergies of concern with other concerns?**

- – **Synergies of remedy with other concerns/remedies?**

- – **Other?**

- – **Process question: First in, first out?**

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Is Prioritization Working?

- **Process is never perfect**
  - **Depends heavily upon predictions and judgment calls**
  - **Particularly difficult in high-tech or otherwise continually changing operations**

- **Success may be difficult to measure**
  - **Prioritization process may help prevent the *worst* or *most frequent* adverse events, but not necessarily *every* adverse event**
  - **Thus, when adverse events keep happening, how to determine if the process is working?**

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Examples of Prioritization Failures?

How many *other pressing issues* (if any) were being addressed when:

– **NASA** responded inadequately to previous events of separated foam that struck the orbiter during launch

– **Concorde** manufacturer and operators responded inadequately to previous tire disintegrations during takeoff

– **Ford and Firestone** responded inadequately to previous tire failures and rollovers in Ford Explorers

– The **intelligence community** responded inadequately to reports about people who wanted to learn to fly – but not how to land – in an airline flight simulator

Missing Element – The Harsh Glare of Hindsight

So . . . Collaboration for Education?

– **Select troublesome area**
  - **Nagging problem for many years**
  - **Many interventions have been tried, not successful**
  - **Likelihood that problems are systemic, not just people**
  - **Effort to address the system problems**
  - **Less defensiveness because not focused on single event**

– **Select collaborative corrective action group**
  - **All who have a hand in the process**
  - **Manufacturers?**
  - **Regulators?**
  - **Students?**

Thank You!!!

Questions?